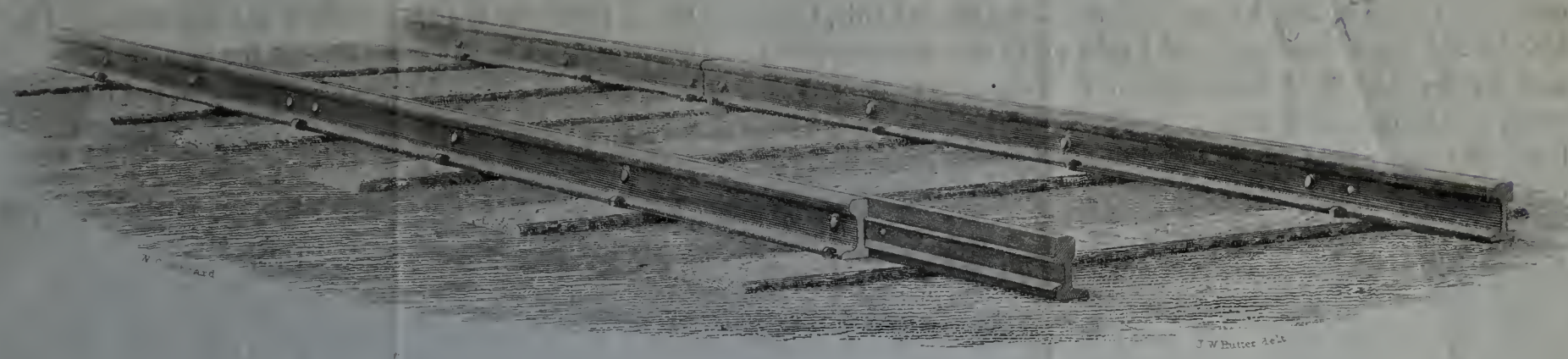
PATENT COMPOUND RAIL FOR RAILROADS.



CIRCULAR.

Sir,—The undersigned begs leave to submit for your examination, his "Patent Compound Rail" for railways, a tolerably correct view of which is given in the above engraving. Since this rail was first introduced, (now nearly two years,) it has more than fulfilled the expectations that were entertained of it, and received the approbation of all who have had it in use, as well as those who have examined it; an increasing interest is being directed toward it in consequence of the defects in the ordinary forms of rails, and which become more and more apparent the longer they are continued in use. The object aimed at in the composite forms, *is to produce a rail which shall approximate as nearly as possible to a continuous bar from one end to the other of the road.* I submit whether this is not *practically* accomplished by the rail herewith offered. The cross joints in the common form are avoided; chairs, clamps, plates, or other contrivances for securing the ends of the rails, are rendered wholly unnecessary; no abrupt depressions or elevations (occasioned by the settling of the rail at the joints) occur, but a smooth and even rolling surface is obtained, over which the engines and cars pass with scarcely any noise, and without any of that disagreeable jarring and oscillating motion usual upon the ordinary forms of rails.

If these results attend the use of the compound rail, it follows as a consequence that much of the wear and tear of rails and machinery will be saved, for if the rolling surface be uniformly smooth, there will be no concussion between the surfaces at rest and in motion; and if no concussion, then the engines, cars, and rails will last longer; so if there be no cross joints in the track, there will be no depressions thereat, but a smooth plain obtained, and the power required to pull loads of equal weights, or maintain equal speeds, will be *less* upon the compound than upon any of the old forms of rails. But the advantages of a *continuous* track over one composed of short bars laid together at the ends with joints (and frequently with wide spaces) at every fifteen or twenty feet, are too manifest to those familiar with the management of railroads to need demonstrating at my hands. It is admitted by all that the form of rail in common use is marked by serious defects, the chief of which is at the joints, (the weak point in the track,) and any improvement that obviates these evils, accomplishes a very important desideratum, effects a great saving in current depreciation of both rails and machinery, and correspondingly in the cost of running railroads, while it increases materially the safety and comfort of all who travel thereon.

By way of showing that these claims are not advanced as mere assumptions, I invite those interested in such matters to inspect the rail in use. A word as to the cost of this rail: This, under certain circumstances, may be something greater than the common form, owing to the enhanced cost of manufacture; this, however, cannot be much, and is more than compensated by the improved quality of iron obtained in a rail of this form, arising from the *greater condensation of the iron*, while the cost of placing this rail upon the road *is less* than the common form, the expense of rivets and riveting being less than the cost of chairs, as shown by the following:—

Common or solid rail.—Cost of chairs, fitting same to rails and cross ties, 528 joints per mile, at 55 cents per joint, rails 20 feet long,		$291 00
One extra spike at each joint is 528 spikes, two to the pound at 3 1-2 cents per pound, is		9 00
		$300 00
Compound Rail.—Rivets, 4,750, 5-8 diameter, at three to the pound, is 1,583 pounds to the mile at 4 3-4 cents per pound, is	$75 18	
Riveting at 24 cents per rod is, per mile,	76 80	
		152 00
Difference in favor of laying one mile of track with compound rail,		$148 00

or about one-and-a-half dollars per ton of iron.

There are ten miles of these rails upon the Utica and Schenectady railroad. They are likewise in use upon the New-York and Erie, Philadelphia and Reading railroads, and I refer to the annexed correspondanee for the opinions of the gentlemen in the management of those roads, as to its merits. I think I am justified in saying that enough has been done by way of trial to demonstrate the *safety* and *economy* of this rail.

Orders for considerable quantities are now being executed for the Hudson River, Rochester and Niagara Falls, Buffalo and Conhocton Valley, Buffalo and Rochester, Utica and Scheneetady, Syracuse and Utica, Michigan Central, Madison and Indianapolis, Cleveland and Columbus, and other leading roads in the country.

Commending the rail to your consideration, and if approved of soliciting your patronage,

I remain yours very respeetfully,

JOHN F. WINSLOW.

Troy, N. Y., July 185/.

RECOMMENDATIONS.

NEW-YORK AND ERIE RAILROAD:

WAY AND STRUCTURE DEPARTMENT,
Engineer's Office, July 7, 1851.

J. F. WINSLOW, Esq.,

Sir,—I have very reeently made a eritieal examination of the compound or eontinuous rail put down on this road by Mr. A. B. Seymour, in September 1849. This rail has now been in use *twenty-two months*, on a portion of the *main line*, nearly two miles from any station, where it has been subjeeted to the *highest speed* of a very heavy class of *engines* and ears. According to the best of my knowledge and belief, there has not been an hour's work done in adjusting this rail sinee it was first laid; yet, it is now in good order, and shows but little of the effeets of wear and tear.

In my opinion this rail is the *safest* one in use, and with slight modifieation ean be made as economieal *if not much more so*, than the ordinary T rail. In many other respects I eonsider this two-part compound rail as superior to any other with which I am acquainted.

Very respeetfully,

Your obedient servant,

S. S. POST.

OFFICE OF THE PHILADELPHIA & READING R. R. Co.,
Philadelphia, June 26, 1851.

J. F. WINSLOW, Esq.,

Dear Sir,—I duly received your favor of the 21st instant. The compound rail seems to do *perfectly* well thus far.

Yours very truly,

JOHN TUCKER, *President*.

UTICA AND SCHENECTADY R. R. OFFICE,
Schenectady, March 1st, 1851.

J. F. WINSLOW, Esq.,

Dear Sir,—Yours of the 4th of February, submitting various interrogatories relative to the "Patent Compound Railroad Iron" furnished by your company, and laid down upon this road, was duly reeeived, to whieh I shall reply in general terms, making the ordinary T rail the standard of eomparison. From my own observation and the experience of locomotive engineers, who are daily running upon the eompound in eonnection with the T rail, (which is superior of its kind,) I am clearly of the opinion that there is a saving in the wear and tear to the machinery of at least twenty-five per eent.

In passing from the T to the compound rail with the trains, a mueh higher rate of speed is attained with the same power, whieh ean only be attributed to the non-resistance of the joints. There ean be no doubt that a less expenditure of motive power is required upon the eompound rail in pulling loads of equal weight, but to what extent I am unable to say.

In November, 1849, about one thousand feet of the eompound rail, furnished by you, was laid down in eonnection with the T rail, in the main traek, over which all trains passing westward from Schenectady were run. This part of the traek has not been repaired or adjusted, *nor has it required to be*, while the T rail, which was laid at the same time, and with great eare, has required repeated adjustment; the ten miles laid last fall has also kept in admirable adjustment.

The experienee on this road, in that respect, is the same as upon all others where the T rail is in use. A very large proportion of the expense of adjusting the traek, is at the joint or end of the rail, whieh is caused by the weakness or break in the traek at that point.

This defeet is entirely obviated by the use of the eompound rail, whieh gives an equal and perfeet bearing upon all the cross-ties, thereby reduein the expense of keeping the track in adjustment more than one half. No part of the eompound rail has broken or been thrown out, while a large number of broken and defective bars of the T rail have been removed; neither has a wheel or shaft broken upon this part of the rail.

No ehair is required in laying the compound rail, the saving in expense of which I consider more than equal to the additional eost of rivets, and riveting together the bars. Two or three rivets only have broken, since the rail has been in use, which, upon examination, proved to have been defective when driven.

Additional experienee is wanted to determine the durability of the eompound rail, in eomparison with the T rail, that the result will be in favor of a eompound rail, I see no reason to doubt.

Very respeetfully,

Your obedient servant,

C. VIBBARD, *Sup't*.

EXTRACTS

From a Pamphlet recently published by B. H. Latrobe, Esq., *Civil Engineer, entitled "Remarks upon the Defects of Railway Tracks, and their Remedy."*

———o—o———

Although the railway structure, in its simple elements, is not an invention of modern times, (the Egyptians are supposed to have used it,) and although in its more mature form, it is now upwards of twenty years old, yet it is still in a progressive state, and is admitted on all hands not to have attained perfection, but to be marked by some serious defects. The best evidence of this, is the great variety of opinions which still prevail in regard to the details of its form and combinations. There is but little agreement among professional men, even in the leading principles of the structure—that is, in regard to the section of the rail, the mode of supporting it, the manner of connecting it at the joint, &c. The undersigned has been an attentive observer of the constant agitation to which these questions have been subjected, and has, as he believes, carefully and impartially weighed the arguments for and against the various ways proposed for the accomplishment of the object which all have had in view, viz: a firm yet somewhat elastic structure, well connected at the joints of the bars and other points of contact of the different pieces composing the track, and yet readily taken apart in the process of repair. His conclusion has been, that there were radical defects in all the existing systems of form and combination of parts, defects to be remedied only by a fundamental change in some of the principles of the structure, and in his view the cure is as clear as the cause of these imperfections.

A railway track has always heretofore consisted of a series of iron bars, of greater or less length, and of various sectional forms, laid together at the ends, and supported throughout their lengths in various ways. Care has usually been taken to give these bars a sufficiency of strength in themselves, and their supports, to make them form a solid and smooth surface for the rolling of the wheels upon them throughout their length; and if the bars could be incorporated together by welding at their ends, or in other words, if there were no joints in the track, there would be little left to desire in any of the well built railways of the present day; for, although the resistance of the soil on which the track rests not being uniform, undulations will occur in the surface of the rails, yet there would be no abrupt depressions or elevations, and the carriages would oscillate with an easy swinging movement, attended by no concussion. The rails, however, not being continuous, but terminating at every distance of fifteen or twenty feet, the wheel has to pass from one to the other, over a very narrow gap it is true, but one quite wide enough almost to annihilate the resistance of the bar at that point as a *beam*, and to make it depend for its power to hold up the wheel, principally upon the resistance of the substance supporting it at that spot, whether that substance be a longitudinal bearer or cross sleeper of timber, or a stone block, according as one or other of these three systems of support are used. Now, to give the bearer, or sleeper, or block, the resistance necessary to compensate fully the loss of strength as a beam, which the bars sustain at their ends, has been in practice found *impracticable* although an approximation thereto may be had by increasing the compactness of the road-bed and the extent of surface bearing thereon at the joints. The approximation, however, is always an uncertain and, at best, an imperfect one, and even in the case of the continuous timber bearer under the rail, which would appear to give the best support to the joints of the bars, the result is unsatisfactory; the compressible character of the wood always permitting the rails to sink into it more or less at their ends. The proved impossibility of effectually sustaining the joints by increased compactness of road-bed, and provision of additional bearing surface, has induced attempts to connect the iron bars at their points of contact so as to form a *splice*, for the restoration of the strength lost at this point. But all such efforts have proved abortive, the effect of the quick passage of heavy trains being to shake and wear loose all the fastenings constituting the splice, and it is now quite apparent that little more can be effected at the joints than to keep the rails, vertically and laterally, sufficiently in place to permit the wheel to pass safely from one bar to another, and not always safely indeed, for there are not wanting instances wherein disastrous accidents have been occasioned by the escape of the rail from what confined it at this point. The only real splice that has been thus far applied to the joints of a line of rails, is the continuous bearing timber; but this, in consequence of the yielding of the wood, is much impaired in its effect, as already observed.

I make the preceding statements as well known facts, not denied by any one at all experienced in the construction and maintenance of railways, or an observant traveler upon them. I could give, were it necessary, a mass of detail upon the subject, collected in my own visits to various lines of railway, and in my correspondence with my professional brethren all over the United States. Suffice it to say, that the existence of the evil of bad joints, and the difficulty of dealing with it, is amply demonstrated by the variety of expedients to *palliate* what is conceded to be *incurable*. Upon one line, for example, are to be found two cast iron chairs, weighing together 45 pounds, applied to each bar; and upon another line no chairs at all, but the rails simply let into the sleepers at the ends and spiked down. Upon other roads a chair weighing from 15 to 25 pounds, with a wooden key to hold fast the rail in it. Upon others again chairs weighing from 12 to 20 pounds, with a lip on each side to lap tightly over the bottom flanges of the rail. On others a simple plate to support the ends of the bars and keep them sidewise in place, depending upon spikes to hold them down. On others the same plate with screw bolts in place of spikes; and lastly, upon one or two roads, two splice plates fitting on each side into the hollows of the rail and drawn tight by screw or cotter bolts in a horizontal position. None of these modes of making the joints secure, operate as a splice in effect, or but partially at the first, for the violent blow given to the end of the bar by every passing wheel, soon jars loose the firmest grip that these fastenings can take. The wooden keys, besides their swelling and shrinking as the atmosphere changes, soon loosen, and the continual driving of them up rapidly wears them out. The spikes break, the screw bolts either snap off or have their thread stripped, and the keys of the cotter bolts become bent and broken from driving them up. The tight fitting clamp chair breaks or wears loose in its lips. In short, no fastening that can be applied at this point holds it long, and where, in despair of getting any contrivance to stand, all are rejected and the rail is simply nailed down upon the sleeper, the latter is soon deeply indented and rapidly worn away by the bars it supports. These mischiefs are of course most observable in the lines of heavy traffic and sometime in use. Upon the great trunk line between Boston and Albany, opened in 1842, the clattering and thumping of the joints was deafening when I passed over it in 1848; the chairs and ends of bars having become loose in their fit, from the wear of six or seven years, and on the same line large renewals of rails had then, and are now, annually taking place, chiefly in consequence of the effect upon the ends of the bars of the blows received there. * * * * * * *

It should be mentioned, while speaking of the difficulties of maintaining the joints of a track, that the endwise movement of the rail, under the blow of the wheel, is one of the most prominent. The bars are not all operated on alike by this cause, and consequently, some being pushed further than others, the openings at the joints become irregular, some being closed entirely, and others widely open. This movement of the rail is a very dangerous one, and unless watched, would soon force the rails quite out of their chairs, especially upon double lines of railway, where the movement of the trains, on each track, is always in the same direction.

The evils have been now, perhaps, sufficiently descanted upon, and we will proceed to speak of their remedy.

Instead of making the rails in solid or single bars, laid end to end, it is proposed to make them in parts combining to form the cross section of the rail;

these parts breaking joints with each other, and held together by rivets, so as to form in effect a continuous bar of compound structure, being as near an approach to an unbroken line of iron as it is physically possible to make. The necessity of providing for contraction and expansion and for repairs to those parts of the rail, which, from the unavoidable inequalities in the texture of the metal, will require to be renewed at different times, manifestly renders the welding of the bars together at their ends, impracticable. We must then break up the body of the iron into parts, which may shrink and dilate, and be removed and replaced, independently of each other; and the question is, how this division of the mass shall be effected? Hitherto it has been by simply cutting off the line at intervals, the mischiefs of which mode have been fully shown. The other mode now proposed, is to divide the mass not only cross-wise, but longitudinally; that is, not only in length but in section, making the several parts resulting from this sectional division unite at different points in the length of the line, so that the wheel will always be sustained by the strength of one portion of the rail, while passing over the gap occasioned by the division of another portion. It is, in short, nothing more than the application of the "break joint" principle to rails, so long recognized, and so successfully used in carpentry and framing of every kind, and indeed, in the railway itself, by those who prefer the continuous bearing timber to the cross sleeper or the stone block. By this division of the bar, a portion of its extreme strength is relinquished, the compound bar being, at its strongest point, somewhat weaker than the solid bar, in the middle of its length. But as the maximum of strength is less in the compound bar, so the minimum is much greater, and thus that approach to uniformity of strength is effected, which is the desideratum; a structure presenting an alternation of very strong and very weak points, being of all others the worst. It has been said, that the compound bar is somewhat weaker in its strongest point, (which would be the point midway between any two contiguous joints,) than the single bar in the middle of its length. But the difference would be less considerable than might be supposed. I judge from an experiment made with a compound bar of fifty pounds per yard, and a solid bar of similar weight, but of the bridge pattern. The two bars, with a clear bearing of three feet, and under a strain of three tons, applied to the middle of their lengths, exhibited the same deflection, although the compound bar had one of its joints, (in one of the under sections,) between the bearings. I do not quote the experiment as conclusive. It was but a single one, and may have been under the influence of some circumstance not observed, which gave too favorable a result for the compound bar. But while conceding fully, that there is a reduction of the maximum of strength, the more than corresponding increase in the minimum, already claimed for the composite rail, is an invaluable acquisition. The loss of extreme strength is, however, not the only objection that might naturally be urged against the compound rail, and, if that compound principle has been already thought of in England, its practical application has probably been prevented by the objection now to be mentioned. I refer to the supposed difficulty of connecting, in a substantial and satisfactory manner, the parts into which the bar is divided, so as to make them hold well together without shaking, or working, or breaking, or looseness of any kind, and so also as to permit them, at the same time, to yield freely to the effects of changes of temperature.

In reflecting upon the subject, I am so strongly impressed with the superiority of the compound principle as to feel *amazed* that it has not, long ago, been adopted, and can only account for the fact that it has not, by this last consideration, which, I confess, operated awhile upon my own mind, so as to make me in the outset not entirely confident of its success. My professional friends, indeed, nearly all hung back at first upon this ground, admitting that the idea in the abstract was a happy one; but fearing its defeat by the supposed impossibility of holding the parts properly together. Nothing short of experimental demonstration would be satisfactory in this, more than in other cases. The fact that the fundamental principles involved in the structure of the rail, were altogether in favor of what was aimed at, did not seem to me to make a due impression. Because the fastenings, by which it was attempted to connect the solid bars at their ends, failed to perform their intended functions, so must the attachments of the compound bar! But the distinction in the two cases, consists simply in the prevalence in the two plans of two opposite principles; in the solid rail the principle of *concentration*, and in the compound rail the principle of *diffusion*. In the former, the whole shock experienced in passing the point of separation of the bars, is concentrated at one point, the single joint; in the latter, the one great shock is divided into two or three very much lesser shocks, and thus is diffused with a greatly diminished intensity over the whole length of the bar, and the fastenings being also similarly dispersed along the bar, the scattered and softened concussions are effectually resisted by them. It would be difficult, indeed impracticable, to compare the different momenta of the mass which experiences these shocks, in the cases of the two kinds of bars; as to do so, with precision, it would be necessary to know exactly the relative spaces through which the wheel of the carriage would fall, in passing the single joint of the solid bar, and the two or three joints of the compound bar. There can, however, be no doubt that the sum of the momenta, in the latter case, would fall much within the single momentum in the former case, and that, therefore, the carriage and the rail would sustain much less injury from the shocks occurring in passing over the compound bar.

But leaving the mathematics of the matter, I will go to the more practical views to be taken of the subject, and to the light which the experience which has happily been obtained, casts thereon. I have thus far discussed the principle of the compound rail in the general, and without reference to any of the various forms it may assume. But I will now say, that notwithstanding the tardiness with which most of the engineers of this country, to whom the improvement has been submitted, have seemed disposed to yield their assent to its value, there is a growing feeling in its favor. * * * * And if we admit that the composite rail is, in the abstract, the best form, we have then to choose between the possible varieties of this form, that may be suggested. * * * * Were I compelled to choose I would take the simplest and most symmetrical of them. * * * * * * * * * * * * *

I have no means of comparing the cost of maintaining a "permanent way," upon my plan with that of any of the various existing modes of construction in England. I am very confident, however, that the difference in favor of the former would be very great indeed. * * * * * * * *

I am satisfied that not less than a third of the labor of adjustment will be saved, and the renewal of materials should be in at least as favorable a proportion. * * * * * * * * * * * * *

All that is required for this purpose being the cutting off the rivet heads with a chisel. But this will be an operation rarely required, and the cheapness of the rivets makes the cost of material a matter of little consequence. If I am right in my suppositions, then the superior safety and smoothness of the new track, attended by a considerable reduction in the cost of repairs to engines and carriages, and a great increase of public security and comfort, and consequently an accession to the popularity of railways as a means of travel, would all combine to place the value of the improvement in a very conspicuous position.

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Among the merits of the compound rail, will be apparent that of retaining its line in curves, better than the solid rail; the breaking of the joints producing in the bearing rails a mutual counteraction of the tendency to straighten into chords, after being sprung to the curve. With bars so long as 20 feet, it is supposed that, even in the heaviest patterns, it will not be necessary to set them, by previous bending, which, in the solid rail, would be indispensable.

A very remarkable advantage from the division of the rail into parts will also be the improvement in the *quality* of the metal. The disposition to increase of weight, has been checked by the difficulty of making a heavy bar perfect. It is understood that the rails of 100 lbs. per yard recently rolled, have turned out so indifferently as to induce a return to lighter patterns. However this may be, it is quite certain that a single bar of any weight cannot be made as sound and tough, as two or three bars of the same length and aggregate section. The compound principle will permit the tendency to increased weight of rail to go much farther than would be possible in the single rail. * * *